

Artificial Intelligence (AI) and Human Communication and Cognition: Hope and Concerns

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ARTICLE INFO

Received: 📅 March 20, 2023

Published: 📅 April 13, 2023

Citation: Sherine Abdelmissih. Artificial Intelligence (AI) and Human Communication and Cognition: Hope and Concerns. Biomed J Sci & Tech Res 49(4)-2023. BJSTR. MS.ID.007849.

ABSTRACT

Since the emergence of AI, extensive discussions were adopted on its clinical applications, including the diagnosis and management of many disorders, including dementia, among others. As a progressively cognitive dysfunction, mainly prevalent in older people, AI has been proposed as a possible tool that help resolve the issues related to the early diagnosis, prevention, management and prognosis of dementia. With rising hope, few concerns are underway, both were briefly mentioned herein. Among the anticipated benefits of AI is allowing more social engagement for old people with dementia, as was with the introduction of smartphones. My concern is that AI might add to distractors that interrupted family gatherings and time spent with older people, which is an integral part to improve the quality of life especially in case of dementia. Until research evidence becomes available, it is prudent to benefit from AI, while considering it an add-on enhancement, but not a replacement to human communication and cognition.

Keywords: Artificial Intelligence; Dementia; Cognition; Communication

Abbreviations: AI: Artificial Intelligence; NHS: National Health Service; NIA: National Institute on Aging; WHO: World Health Organization; AD: Alzheimer's Disease

Introduction

Use of artificial intelligence (AI) is now evolving to include almost every aspect of life. Claims about how AI can become a turning point in research area are ongoing. In the medical field, extensive discussions are now adopted regarding the utility of incorporating AI for diagnosing and treatment of Alzheimer's disease, the most common type of dementia (National Health Service (NHS), 2021) [1]. The turbulence of ideas about extensive use of AI in medical research and clinical practice, while studded with hope, yet fraught with fears. Aiming at judicious use of AI, I attempted to adopt a neutral point of view, by stating, briefly, the emerging benefits and possible drawbacks of AI, in terms of cognitive abilities, exemplifying dementia as a progressive cognitive dysfunction (National Institute on Aging (NIA), 2022) [2].

Dementia

Dementia is the seventh leading cause of death, 60% of 55 million persons with dementia live in low-to-middle income countries. Owing to an increase in life expectancy, more people are anticipated to have dementia by 2050 (World Health Organization (WHO), 2022) [3]. Dementia is the gradual loss of cognitive functions, until 'interfering with a person's daily life and activities' as quoted from the (NIA, 2022) [2]. The most common types of dementia are Alzheimer's disease (AD) and the vascular type, both can co-exist (NHS, 2021) [1]. Noteworthy, dementia is not part of the normal aging process. Although uncommon, 5%-6% of AD cases can occur at younger age, termed early onset or young onset AD, where symptoms begin before 65 years of age (Mayo Clinic, 2022) [4]. Apart from dementia, cognitive impairment can be mild when functions are below normal, but the patient retains the ability to perform his daily activities. It could be of

the 'amnesic' or 'non-amnesic' type, depending on whether memory is affected or not. Mild cognitive impairment does not necessarily progress to dementia (Albert, et al. [5]).

Problematic Diagnosis and Management of Dementia

Firstly, the diagnosis of dementia requires a good history-taking focusing on cognitive deterioration affecting daily activities. At least one family member should assist and confirm such cognitive decline, the issue occurs when the conflict arises between the patient's denying any health problems and his claims about a certain type of 'conspiracy' ongoing to get rid of him/her, for personal interest in his/her heritage, which could apply in some cases. Furthermore, daunting, but sensitive and specific mental, psychosocial, and physical examinations should be performed. An ideal mental state assessment should involve all aspects of cognition, including, but not limited to, memory, attention, language, special orientation, executive functions, and mood, meanwhile not all cognitive domains must be affected in dementia. Thorough neurological examination, along with neuroimaging, would help identify underlying causes such as stroke or brain tumors, that could pose psychologic stress and economic burden to the patient and /or their caregivers (Shinagawa [6]). Notably, for every item of the above-listed cognitive functions, the brain exerts multiple, complicated tasks, that need to be assessed to help plan a health care service and non-pharmacologic treatment tailored to individualized needs, based on the most severely affected tasks.

It is to be mentioned that the non-pharmacologic treatment is an integral part of dementia improvement, especially when some cases are resistant, non-compliant, or non-responsive to the currently available medications, mostly limited to either, targeting the cause or reversing the neuropathology of the cholinergic theory of AD. Such non-pharmacologic management plans would rather depend on 'healthy' social interactions and encouraging cognitive and physical activities. I would like to emphasize the importance of 'healthy' social interactions, as some social engagements are 'unhealthy' and would lead a patient with dementia to depression, more social isolation, and non-compliance, not only to treatment, but to the desire of existing. Besides, the choices among pharmacologic treatments are limited, especially if dementia is not of the Alzheimer's type and no obvious cause could be identified. Either primary or secondary failure of pharmacologic treatment can intervene, added to the fact that none of the currently available medications is devoid of side effects, necessitating treatment discontinuation, or addition of other medications to remedy such side effects. Last, but not least, only symptomatic cases are diagnosed, while early asymptomatic cases of AD are not recognized (Sperling [7]) and in late stages, it is difficult to differentiate AD from other causes of dementia (Corriveau, et al. [8]).

Artificial Intelligence and Dementia

Emerging Benefits: AI could be an effective add-on to assist older people interact socially and have more friendly communications, enhancing their cognitive abilities (Myhre [9]), and defeating loneliness and depression, knowing that both depression and cognitive impairment are positively linked (Kwak [10]), so that AI could become a pre-emptive tool in terms of dementia, as was with the introduction of mobile phones (Lin, et al. [11]). AI might fill the gaps of limited dataset availability to develop machine models, offering a cost-effective tool, instead of the current costly computer-based or mobile-based applications (Alexander [12]). As mentioned in the review of (Kolluri [13]), AI could assist reducing the costs for research and development (R&D) of novel medications, alleviating the economic burden at public, healthcare providers and governmental levels, by marketing medications at reasonable prices. Logically, the availability of novel cost-effective medications is anticipated to enhance the compliance and accessibility to such medications, secondarily improving the overall health and increasing the life expectancy of the older population. The financial obstacle towards the discovery of novel targets will encourage pharmaceutical companies to address new hypotheses related to dementia and will attempt to make more available medications in this context.

In my opinion, by reducing the costs of drug manufacturing, AI, not only will it assist many countries to get access to costly medications, but also it will help them build their own pharmaceutical industry. This might be relevant also to low-income countries, especially that low-income was found to be among the risk factors to developing dementia (Chaaya, et al. [14]). With AI, the enhanced availability of information will encourage self-learning in young generation, reducing the time and effort for learning might reduce dropouts from schools especially in regions where low education is prevalent, knowing that low education could predispose to developing dementia later (Vemuri, et al. [15]).

Perspective Concerns: Importantly, one of the risk factors for developing dementia is the lack of cognitive, physical, and social activities (Wilson, et al. [16-18]). This would lead us to think whether adding more capabilities to online search limits physical activities and social interactions or not. With the ability of processing and gathering huge amount of information using AI would, the need for seeking expert opinion might be reduced, depriving older adults the warmth of sharing their precious memories, success, failures, sorrowful and joyful moments with the young generation, distracting the young generation from spending more time caring about their family members or sharing in family events, thus cutting off the generation continuum. In my opinion, a consensus is that AI would never replace the warmth of human communication, especially when it comes to older people with dementia. This was elaborated in a study involving nursing home residents with dementia, when

improved communication reduced aggressive and resilient responses to medical care staff (Williams [19]).

Conclusion

AI could support the early and accurate diagnosis of dementia. By using AI, less expensive techniques for novel drug research and development can be offered, advantageously reflected on less costly medications. Judicious use of technology, including AI, could reduce possible negative impacts, including distraction from effective communication between young and old generations. Let us not rush into expectations or resistance until more short- and long-term research evidence about AI is available, hoping that AI would help advance biomedical research and clinical practice as anticipated.

Financial Resource

None.

Conflict of Interest

None.

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ISSN: 2574-1241

DOI: 10.26717/BJSTR.2023.49.007849

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